

Docket No.: 060188-0555

**PATENT**

CofC

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of

Yoshinao HARADA

Application No.: 10/602,724

Patent No.: 7,157,780

Filed: June 25, 2003

Customer Number: 53080

Confirmation Number: 1545

Group Art Unit: 2826

Examiner: Fazli Erdem

For: SEMICONDUCTOR DEVICE AND METHOD FOR PRODUCING THE SAME

**REQUEST FOR CERTIFICATE OF CORRECTION UNDER 37 CFR 1.322**

Mail Stop COC  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**Certificate**

MAY 03 2007

**of Correction**

Sir:

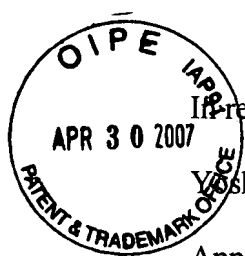
In reviewing the above-identified patent, a printing error was discovered therein requiring correction in order to conform the Official Record in the application.

The error noted is set forth on the two attached copies of form PTO-1050 Rev. 2-93 in the manner required by the Commissioner's Notice.

Specifically, on the title page of the Letters Patent, under section "(56) References Cited, U.S. PATENT DOCUMENTS", add – US 6,737,716 B1 05/2004 Matsuo et al. –. The references was cited in the first office action dated August 19, 2004, but not listed in PTO form 892. For your immediate reference a photocopy of the office action dated August 19, 2004 is attached.

The change requested herein occurred as a result of printing the Letters Patent and the Certificate should be issued without expense under Rule 322 of the Rules of Practice. Accordingly, Applicants request issuance of the Certificate of Correction.

MAY - 7 2007



**Patent No.: 7,157,780**

Please charge any shortage in fees due in connection with the filing of this paper to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

McDERMOTT WILL & EMERY LLP

  
Michael E. Fogarty  
Registration No. 36,139

600 13<sup>th</sup> Street, N.W.  
Washington, DC 20005-3096  
Phone: 202.756.8000 MEF:JGH  
Facsimile: 202.756.8087  
**Date: April 30, 2007**

**Please recognize our Customer No. 53080  
as our correspondence address.**

MAY - 7 2007

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 7157780  
DATED : January 02, 2007  
INVENTOR(S) : Yoshinao HARADA

It is certified that an error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the title page of the Letters Patent,

Under section "(56) References Cited, U.S. PATENT DOCUMENTS", add –  
US 6,737,716 B1 05/2004 Matsuo et al. –

MAILING ADDRESS OF SENDER:  
McDermott Will & Emery LLP  
600 13th Street, NW  
Washington, DC 20005  
USA

PATENT NO.  
7,157,750

No. of add'l copies  
@ 50¢ per page

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FORM PTO 1050 (Rev. 2-93)

MAY - 7 2007

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 7157780  
DATED : January 02, 2007  
INVENTOR(S) : Yoshinao HARADA

It is certified that an error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the title page of the Letters Patent,

Under section "(56) References Cited, U.S. PATENT DOCUMENTS", add –  
US 6,737,716 B1 05/2004 Matsuo et al. –

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USA

PATENT NO.  
7,157,750

No. of add'l copies  
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FORM PTO 1050 (Rev. 2-93)

MAY - 7 2007

(12) **United States Patent**  
**Matsuo et al.**

(10) Patent No.: **US 6,737,716 B1**  
 (45) Date of Patent: **May 18, 2004**

(54) **SEMICONDUCTOR DEVICE AND METHOD OF MANUFACTURING THE SAME**

(75) Inventors: **Kouji Matsuo, Yokohama (JP);  
 Tomohiro Salto, Yokohama (JP);  
 Kyoichi Suguro, Yokohama (JP);  
 Shinichi Nakamura, Yokohama (JP)**

(73) Assignee: **Kabushiki Kaisha Toshiba, Kawasaki (JP)**

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/492,780**

(22) Filed: **Jan. 28, 2000**

(30) **Foreign Application Priority Data**

Jan. 29, 1999 (JP) ..... 11-022688  
 Feb. 19, 1999 (JP) ..... 11-041343  
 Sep. 21, 1999 (JP) ..... 11-267207

(51) Int. Cl.<sup>7</sup> ..... **H01L 29/76; H01L 31/062;  
 H01L 23/48; H01L 29/12**

(52) U.S. Cl. .... **257/406; 257/412; 257/413;  
 257/754; 257/755; 257/915**

(58) Field of Search ..... **257/406, 412,  
 257/413, 754, 755, 915**

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

5,747,361 A \* 5/1998 Ouellet ..... 437/190  
 5,801,427 A \* 9/1998 Shiratake et al. .... 257/412  
 5,907,188 A \* 5/1999 Nakajima et al. .... 257/751  
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 6,162,715 A \* 12/2000 Mak et al. .... 438/592  
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 6,284,635 B1 \* 9/2001 Jang ..... 438/592

**FOREIGN PATENT DOCUMENTS**

DE 29 40 200 A1 \* 3/1981

**OTHER PUBLICATIONS**

Wittner, M. et al. "Oxidation Kinetics of TiN Films", J. Appl. Phys., vol. 52, pp. 6659-6664, Nov. (1981).

Matsuo, K. et al., "Reliable High-k TiO<sub>2</sub> Gate Insulator Formed by Ultrathin TiN Deposition and Low Temperature Oxidation", Extended Abstracts of the 1999 International Conference on Solid State Devices and Materials pp. 164-165, (1999).

\* cited by examiner

*Primary Examiner*—Long Pham

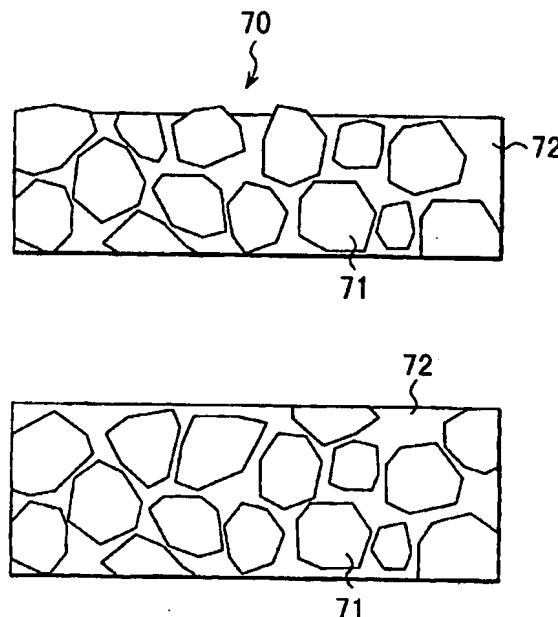
*Assistant Examiner*—Shrinivas H. Rao

(74) *Attorney, Agent, or Firm*—Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P.

(57) **ABSTRACT**

Disclosed is a method of manufacturing a semiconductor device, comprising forming a metal compound film directly or indirectly on a semiconductor substrate, forming a metal-containing insulating film consisting of a metal oxide film or a metal silicate film by oxidizing the metal compound film, and forming an electrode on the metal-containing insulating film.

**7 Claims, 25 Drawing Sheets**



MAY 18 2004



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/602,724	06/25/2003	Yoshinao Harada	60188-555	1545

7590 08/19/2004  
McDermott, Will & Emery  
600 13th Street, N.W.  
Washington, DC 20005-3096

EXAMINER

ERDEM, FAZLI

ART UNIT PAPER NUMBER

2826

DATE MAILED: 08/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

MAY 15 2007

# Office Action Summary

Application No.

10/602,724

Applicant(s)

HARADA, YOSHINAO

Examiner

Fazli Erdem

Art Unit

2826

Period for Reply

The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 25 June 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 6-31 is/are rejected.
- 7) ☒ Claim(s) 2-5 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 06/25/2003
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

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***Double Patenting***

4. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 7-31 rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1- of U.S. Patent No. 6,642,131. Although the conflicting claims are not identical, they are not patentably distinct from each other because in Claims 7-19, they both claim a method for producing a semiconductor device which comprises the steps of forming a high dielectric constant film containing a metal, oxygen and a predetermined substance on a substrate, performing a heat treatment with respect to the high dielectric constant film to diffuse silicon from the side of the substrate into the high dielectric constant film to form silicon-containing high dielectric constant film and forming a conductive film for serving as a gate electrode on the silicon-containing high dielectric constant film. Regarding Claims 20-31, they both claim a method for producing a semiconductor device comprising the steps of forming a high dielectric constant film containing a metal, oxygen and hydrogen

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Art Unit: 2826

on a substrate, performing a heat treatment with respect to the high dielectric constant film to diffuse silicon from the side of the substrate into the high dielectric constant film in order to form a silicon-containing dielectric constant film and forming a conductive film for serving as a gate electrode on the silicon-containing high dielectric constant film.


### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fazli Erdem whose telephone number is (571) 272-1914. The examiner can normally be reached on M - F 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

FE  
August 9, 2004

  
NATHAN J. FLYNN  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800

MAY 15 '07 2007